METHYL BROMIDE CRITICAL USE RENOMINATION FOR POST-HARVEST -- DATES

NOMINATING PARTY: The United States of America

FILE NAME: USA CUN15 **POST HAVEST USE FOR DATES**

BRIEF DESCRIPTIVE TITLE OF NOMINATION:

Methyl Bromide Critical Use Nomination for Post Harvest Use on Commodities (Submitted in 2014 for 2015 Use Season)

QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION:

TABLE 1: QUANTITY OF METHYL BROMIDE REQUESTED IN EACH YEAR OF NOMINATION

YEAR	NOMINATION AMOUNT (KILOGRAMS)
2015	**310 kg**

(Details on this page are requested under Decision Ex. I/4(7), for posting on the Ozone Secretariat website under Decision Ex. I/4(8).)

In assessing nominations submitted in this format, TEAP and MBTOC will also refer to the original nomination on which the Party's first-year exemption was approved, as well as any supplementary information provided by the Party in relation to that original nomination. As this earlier information is retained by MBTOC, a Party need not re-submit that earlier information.

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Following the requirements of Decision IX/6 paragraph (a)(1) The United States of America has determined that the specific use detailed in this Critical Use Nomination is critical because the lack of availability of methyl bromide for this use would result in a significant market disruption. ■ *Yes* ☐ *No*

Signature _____ Name _____ Date _____

Title: _____

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LIST OF DOCUMENTS SENT TO THE OZONE SECRETARIAT IN OFFICIAL NOMINATION PACKAGE:

1. PAPER DOCUMENTS: **Title of paper documents and appendices**	**No. of pages**	**Date sent to Ozone Secretariat**
2. ELECTRONIC COPIES OF ALL PAPER DOCUMENTS: ***Title of each electronic file (for naming convention see notes above)**	**No. of kilobytes**	**Date sent to Ozone Secretariat**
USA CUN15 POST DATES		

* Identical to paper documents

METHYL BROMIDE CRITICAL USE RENOMINATION FOR POST-HARVEST -- DATES

1. SUMMARY OF NEED FOR METHYL BROMIDE

Commodity fumigation with methyl bromide is used primarily at harvest time, when rapid fumigation is needed to keep up with the large volumes of incoming commodities that need to be shipped to market in three days for maximum value.

Sulfuryl fluoride, as ProFume®, remains registered for the uses included in this nomination in the U. S. EPA has published a proposed order to revoke tolerances; however, for the purposes of this nomination, USG is assuming that sulfuryl fluoride will continue to be available. For additional information, please refer to the links on EPA's website: http://www.epa.gov/oppsrrd1/registration_review/sulfuryl-fluoride/evaluations.html.

TABLE 2. NOMINATION AMOUNT

SECTOR		COMMODITIES California Date Commission
Quantity Requested for 2014:	Amount (kgs)	325
Quantity Recommended by MBTOC/TEAP for 2014 :	Amount (kgs)	325
Quantity Authorized by Parties for 2014:	Amount (kgs)	325
	Volume (1000 m^3)	15.5
	Rate	21
Transition from 2014 Baseline Adjusted Value	Percentage (%)	5%
Quantity Required for 2015 Nomination:	Amount (kgs)	**310**
	Volume (1000 m^3)	**15.5**
	Rate	**20**

Footnote: Lower amount of methyl bromide nominated based on a lower use rate of 20 kg/1,000 m^3.

2. SUMMARIZE WHY KEY ALTERNATIVES ARE NOT FEASIBLE

This sector comprises palm dates, which are subject to infestation by several insect pests. Since infestation begins in the field, methyl bromide is used to rapidly fumigate harvested commodities. Dates are grown in Imperial and Riverside counties in California. Methyl bromide is used to rapidly fumigate California dates at harvest time, when up to 364,000 pounds per day are being harvested within a relatively tight timeframe during the fall. These dates are harvested by hand, and growers need to get them to the marketplace in three days for maximum value. Although several insects may infest dates, all life stages of the dried fruit beetle, *Carpophilus hemipterus*, and carob moth, *Ectomyelois ceratoniae*, are the most damaging species.

The California Date Commission reports that it is currently testing the efficacy of methyl bromide alternatives on dates, in collaboration with Dow AgroSciences and Dr. Walse of USDA Agricultural Research Service. Research with sulfuryl fluoride indicates that it is currently the methyl bromide alternative with the greatest potential to rapidly disinfest California dates at harvest time (Walse 2013). Recent studies have shown that under vacuum or atmospheric conditions, sulfuryl fluoride is effective over the required treatment time against adult, pupal, and larval stages of stored product pests (Walse 2012). Work by Williams and Toms (2008) indicate excellent control of all stages of dried fruit beetle and carob moth with sulfuryl fluoride at label rates. However, Dr. Walse's preliminary results using sulfuryl fluoride with the maximum label-allowed exposure show less than adequate egg kill at temperatures over the range 60-80°F for several species of stored product pests. Phosphine takes longer than sulfuryl fluoride to fumigate dates (5 to 7 days), and during this time the dates ferment, resulting in an off-flavor and an unmarketable product.

3. SUMMARY OF RECENT RESEARCH

Walse (2012) has demonstrated that nearly two-fold the maximum sulfuryl fluoride exposure allowed on the label is required for 95 percent control of carob moth eggs at 60°F, 24 hours, and atmospheric pressure. Studies were conducted to determine the efficacy of sulfuryl fluoride toward carob moth eggs at 70°F and atmospheric pressure. Eggs of the dried fruit beetle are not controlled at atmospheric pressure, 24 hours exposure, and temperature of 80°F, or below, given the current label rates. It takes longer to control these two insect pests with sulfuryl fluoride compared to methyl bromide which makes it more difficult to get the fruit to market in a short period of time.

Because temperatures at night can fall below 70°F, further research is needed to optimize the ovicidal efficacy of sulfuryl fluoride. In addition, further research is needed to determine the efficacy that results from pairing sulfuryl fluoride with a more potent ovicide, such as propylene oxide. The Dried Fruit Association of California and Walse continue to conduct research on combinations of PPO, sulfuryl fluoride and carbon dioxide (CO_2). Muhareb's (2009) presentation at the 2009 MBAO noted that combining the two fumigants at atmospheric pressure in a 1:1 molar ratio with 5-10% CO_2 showed a LD_{95} of 432 mg·h/l on red flour beetles (RFB) eggs and a LD_{95} of 353 mg·h/l on RFB larvae adding carbon dioxide increased the larval efficacy of the PPO+SF mixture. Hopefully, this will be true on other pests found on fresh dates. At this time propylene oxide is not registered for use on dates so this combination cannot be used in the United States.

Past data showed red flour beetle (RFB) larvae fumigated with PPO had an LD_{95} using 606 mg·h/l SF is just the opposite requiring higher concentration x time (CT) product for the eggs, LD_{95} 966 mg·h/l,10% CO_2 was the most effective. Without CO_2, combining the two fumigants together showed a LD_{95} of 432 on RFB eggs and a LD_{95} of 353 on RFB larvae. Adding 10% CO_2 reduces the dosages by about two-thirds of the fumigants used alone. The CO_2 along with the synergy of the blend reduces cost, lowers environmental emission and provides greater safety (Muhareb 2009).

Reichmuth and Klementz (Barakat et al., 2009) discussed at the 2009 MBAO possible investigations to overcome the inability of sulfuryl fluoride to control the egg stage of many stored product pest insects. These included combinations of gases such as sulfuryl fluoride with phosphine or carbon dioxide. They also proposed using heat to increase the efficacy of sulfuryl fluoride. Their preliminary data demonstrated that these combinations show promise for many stored product pests of dried fruits and tree nuts. (Barakat et al., 2009)

Reichmuth, also at the 2009 MBAO, presented data regarding sulfuryl fluoride efficacy on the eggs of the rice moth *Corcyra cephalonica*. He showed that older eggs were more tolerant of sulfuryl fluoride than were the young eggs. His data show that by increasing the exposure time the difference between the ages of the eggs is reduced and disappears. His results indicated that full control was achieved at a concentration of 4.19 mg/l sulfuryl fluoride only after 5 days of fumigation (CT=120 x 4.19mgh/l=502mgh/l); 5.24 mg/l were sufficient to control all investigated eggs with exposure of 4 days (CT=503 mgh/l); and 5 days (CT=628 mgh/l), as well as three days old eggs with 3 d fumigation (CT=377 mgh/l). Three days fumigation served to kill all eggs of all ages with 6.24 mg/l (ct=449mgh/l). These ct-products are in range with corresponding values for lethal ct products for the other related stored product pest moths *Ephestia kuehniella*, *Plodia interpunctella* and *Ephestia elutella* (Barakat et al., 2009).

Williams (2009), of Dow AgroSciences, presented the results of sulfuryl fluoride investigations on carob moth (*Ectomyelosis ceratonia*) or CM in freshly harvested dates. Complete mortality of eggs and larvae was achieved with 332 oz-h/MCF (thousand cubic feet) (g-h/m^3) CT dosage of sulfuryl fluoride (ProFume®) at 21°C (70°F) during a 14-h exposure (essentially 1.48 lbs/MCF). Compare that to 1.5 lb/MCF of MB, for chambers with a moderate HLT (half loss time) of 20 h and a short, overnight exposure of 16 h (Williams, 2009).

Williams (2009) reported that chamber fumigation needing a quick overnight turnaround represents about 30% of the date production fumigations. The remaining 70% of the fumigations occur in 5.0-MCF stacks of bins under tarps in the open yard, when time is not critical and the tarps may be kept sealed for weeks or even months. With the anticipated 50+ h HLT actually measured with the tarps in 2007, a fumigation using only 1.3 lb/MCF of ProFume would require 16 h to achieve 300 oz-h/MCF for carob moth control. Further gas savings can occur by extending the exposure time. At 50-h HLT and 72-h exposure, a 300 oz-h/MCF CT dosage for ProFume can be achieved applying only 0.4 lb MCF (Williams, 2009).

Williams (2009) reported that the codling moth efficacy of sulfuryl fluoride at 300 oz-h/MCF CT dosages combined with good HLT, which can be achieved with good structural sealing techniques, and demonstrated that sulfuryl fluoride is an equivalent (weight: weight) alternative to methyl bromide in fresh dates for short-exposure overnight fumigations. When extended exposures are possible in tarped stacks, sulfuryl fluoride becomes superior (weight: weight) to methyl bromide. Williams (2009) concludes that his study demonstrates that in all aspects (technical, practical and economical), sulfuryl fluoride is a viable alternative to methyl bromide for control of codling moth when fumigating dates in storage.

Liu (2011) investigated the potential of oxygenated phosphine on insect pests of lettuce. Dr. Liu included a stored product pest, Indianmeal moth, in his investigations and found that a 48-hour

fumigation in chambers with 30% oxygen content did result in significant mortality of larvae and eggs. This is only one study and much more research needs to be done, especially with dates. However, this could be an area of future research for the industry.

4. ECONOMIC ANALYSIS OF TRANSITION TO ALTERNATIVES

TABLE 3. ECONOMIC SUMMARY FOR EACH ALTERNATIVE

METHYL BROMIDE ALTERNATIVE	ECONOMIC SUMMARY
PHOSPHINE	Phosphine is a viable alternative for walnuts and dried fruit in storage. However, this nomination is for fruit being shipped immediately to market not fruit in storage.
SULFURYL FLUORIDE	SF is a viable alternative for many but not all pests found on dates. SF costs less per kg than MeBr, but application rates may be higher.

An economic analysis of alternatives was conducted for fresh dates. The economic analyses of transition to alternatives are based on the cost of transitioning an example amount of fresh dates treated with methyl bromide or sulfuryl fluoride.

The analyses focus on the differences in the cost of fumigant gas and the cost of fumigation space (i.e., fumigation chambers) between methyl bromide and the sulfuryl fluoride. It does not take into account any losses that might occur due to differences in product performance (i.e., efficacy) against different life stages of the target pests. The cost to transition to SF is negligible for dates but will not control dried fruit beetle eggs in the time available.

Dates

The dried fruit industry has already replaced a large portion of methyl bromide with phosphine and sulfuryl fluoride in processing dried fruits. The USG nomination for methyl bromide is based only on areas where the industry needs to harvest and ship the fruit in a short period of time.

The results of the economic analysis for dates are presented in Table 4 and 5. Sulfuryl fluoride is the only alternative considered for dates. A transition to sulfuryl fluoride will result in cost savings for the industry of approximately $9,000 per year per 15,500 cubic meter fumigation facility. SF will work for dates in storage but does not provide rapid enough control for dates being shipped immediately to market.

Table 4. Summary Information on Date Industry and Methyl Bromide

Production and Value	
Commodity Metric Tons Produced per Year	19,396
Gross Revenue per Metric Ton	$ 32,693,000
MeBr Use	
MeBr Authorized by Parties 2014 (kg)	325
Commodity Treated with 2014 Authorized MeBr (cu m)	15,500

Table 5. Analysis of transition to alternatives for dates treated with methyl bromide

	Methyl Bromide	Sulfuryl Fluoride
Cubic meters to be treated (example volume)	15,500	15,500
Total gas needed for fumigation (kgs)	310	310
Price of fumigant gas ($ / kg)	$ 39.68	$ 11.02
Total cost of fumigant gas ($)	$12,316	$3,421
Cost difference between MeBr and alternative		$ (8,895)

[1] Assumes rate of 1.25 lbs/1,000 cu ft [20 g/cu m] for methyl bromide, 1.25 lbs/1,000 cu ft [20 g/cu m] for sulfuryl fluoride.
[2] Differences from previous amount of gas caused by change of use rate for both MeBr and SF. In previous years rates of up to 24 g/cu m were used in the calculations.

5. CONCLUSION

Dates are subject to infestation by several pests. This nomination is for use on dates that depend upon a rapid fumigation during harvest. This nomination is only for the dates that are harvested and need to be sent to the market rapidly (within 3 days).

6. CITATIONS

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